



Dave Heineman
Governor

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Concrete Encased Electrodes

Many questions have been addressed to the State Electrical Division regarding the “new” requirement for grounding to re-bar in footings, found in the 2005 edition of the National Electrical Code, Article 250.50 & 250.52(A)(3). Actually, this isn’t a new requirement. The language was changed because the code making panel had been unaware this electrode, if present, wasn’t being used. The language is intended as clarification of a long standing rule.

The following information is intended to help, by explaining the state’s position on this issue:

- Is this type electrode as good as a ground rod? No. It’s much, much better. The resistance to earth of a made electrode like a ground rod will vary, depending on soil moisture, contact pressure, etc. In many cases, values far in excess of the code maximum 25 ohms are encountered after installation. Further, depending on soil conditions, ferrous (even copper clad ground rods) electrodes can be consumed, leading to systems with very inadequate or non-existent grounding. A concrete encased (Ufer) electrode will maintain a resistance of 3 ohms or less to ground for as long as the foundation is there.
- Lots of footings are poured without any re-bar. Do I have to install re-bar to be in compliance with the NEC? No. Article 250.50 says, “All grounding electrodes that are present.....” If it isn’t present, there’s no requirement to install one of this type. However, a supplemental electrode of some type is required by 250.53(D)(2), and this could be used for that purpose, but it doesn’t have to be. (In effect, the requirement for a supplemental ground rod would go away if a concrete encased electrode is present.
- What if vertical 9’ sections are installed in the poured walls associated with the footings? They generally don’t tie to anything. Do I have to bond to those? No. According to Article 250.52(A)(3), the electrode must be “..... located within and near the bottom of a concrete foundation or footing”, and must be at least 20’ X ?”. Isolated vertical nine foot sections don’t fill the bill.
- So, how do I get the 20’? Must I weld the re-bar together? No. Welding re-bar, if improperly accomplished, can cause

more harm than good. The code says “the usual steel tie wires shall be permitted.”

- If there isn’t any re-bar in the footing, do I then have to install “at least 20’ of bare copper conductor, not smaller than 4AWG?” No. Not unless you intend to use it as the supplemental electrode required by 250.53(D)(2).
- How do I attach my grounding electrode conductor to a piece of re-bar? Some companies make a device specifically [listed] for the purpose. Although some jurisdictions might allow bronze ‘J’ clamps with non-ferrous bolts, or bronze ground rod clamps (which may not have been specifically tested and listed for installation in concrete, but which, also, are not more likely to corrode being encased in concrete than dirt ... a marking of DB on the clamp indicates it is suitable for both direct burial and concrete encasement), some might not. Check with your authority having jurisdiction. The state will accept any of the above methods, and exothermic welding.

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Employee of the Year

District 11 Inspector Michael Bouwens is the division Employee of the Year. Mike has gone out of his way to help alleviate division computer problems, and has volunteered to help where needed unstintingly.



Congratulations, Mike!

FROM THE CHIEF

Well it is time for another newsletter, and with temperatures near 100 degrees I hope you are all reading this inside an air-conditioned office or job trailer. If you don't have an air conditioned job trailer you may want to convince the boss that storing conductors in a cool place will make them pull easier, and give you a better place to sleep, I mean study the blue prints.

I receive many calls wondering what code rules the Nebraska Electrical Division enforces. The State Electrical Division uses the Nebraska State Electrical Act and Board Rules as our guideline. Section 81-2104 (5) states in part:

The board shall be governed by the minimum standards set forth in the National Electrical Code issued and adopted by the National Fire Protection Association in 2005, Publication Number 70- 2005, and amendments to the code adopted as of January 1, 2003.

The only amendments to the code are found in Board Rule 18 and are listed here:

Amendment NEC 2005 - 210.12.

Section 210.12. Amendment; Arc-Fault Circuit-Interrupter Protection. Section 210.12 of the 2005 National Electrical Code is hereby amended as follows: Delete the entire Section 210.12.

Amendment NEC 2005 - 334.10.

Section 334.10. Amendment; Uses Permitted For Non-Metallic Sheathed Cable. Section 334.10 of the 2005 National Electrical Code is hereby amended to read as follows:

334.10. Uses Permitted. Type NM, Type NMC, and Type NMS cables shall be permitted to be used in the following: (1) One- and two-family dwellings. (2) Multifamily dwellings and other structures, except as prohibited in Section 334.12. (3) Cable trays, where the cables are identified for the use.

(A) Type NM. Type NM cable shall be permitted for both exposed and concealed work in normally dry locations. It shall be permissible to install or fish Type NM Cable in air voids in masonry block or tile walls where such walls are not exposed or subject to excessive moisture or dampness.

(B) Type NMC. Type NMC cable shall be permitted as follows:

(1) For both exposed and concealed work in dry, moist, damp, or corrosive locations. (2) In outside and inside walls of masonry block or tile. (3) In a shallow chase in masonry, concrete, or adobe protected against nails or screws by a plate at least 1.59 mm (1/16 in.) thick, and covered with plaster, adobe, or similar finish.

(C) Type NMS. Type NMS cable shall be permitted for both exposed and concealed work in normally dry locations. It shall be permissible to install or fish Type NMS cable in air voids in masonry block or tile walls where such walls are not exposed or subject to excessive moisture or dampness. Type NMS cable shall be used as permitted in Article 780.

Amendment NEC 2005 - 334.12.

Section 334.12 Amended; Uses Not Permitted For Non-Metallic Sheathed Cable. Section 334.12 of the 2005 National Electrical Code is hereby amended to read as follows:

334.12. Uses Not Permitted.

(A) Types NM, NMC, and NMS. Types NM, NMC, and NMS cables shall not be used in the following:

(1) In any multifamily dwelling or other structure exceeding three floors above grade. For the purpose of this article, the first floor of a building shall be that floor that has 50 percent for more of the exterior wall surface area level with or above finished grade. One additional level that is the first level and not designed for human habitation and used only for vehicle parking, storage, or similar uses shall be permitted. (2) As service-entrance cable. (3) In commercial garages having hazardous (classified) locations as provided in Section 511.3. (4) In theaters and similar locations, except as provided in Section 518.4. (5) In motion picture studios. (6) In storage battery rooms. (7) In hoistways or on elevators or escalators. (8) Embedded in poured cement, concrete or aggregate. (9) In any hazardous (classified) locations, except as permitted by Sections 501.4(B), Exception, 502.4(B), Exception No. 1, and 504.20.

(B) Types NM and NMS. Types NM and NMS cable shall not be installed in the following: (1) where exposed to corrosive fumes or vapors. (2) Where embedded in masonry, concrete, adobe, fill, or plaster. (3) In shallow chase in masonry, concrete, or adobe and covered with plaster, adobe, or similar finish.

Amendment NEC 2005 - 430.102.

Section 430.102 Amended; Motor Disconnect, Location. Section 430.102 of the 2005 National Electrical Code is hereby amended to read as follows:

430.102. Location.

(A) Controller. An individual disconnecting means shall be provided for each controller and shall disconnect the controller. The disconnecting means shall be located in sight from the controller location.

Exception: No. 1: For motor circuits over 600 volts, nominal, a controller disconnecting means capable of being locked in the open position shall be permitted to be out of sight of the controller, provided the controller is marked with a warning label giving the location of the disconnecting means.

Exception No. 2: A single disconnecting means shall be permitted for a group of coordinated controllers that drive several parts of a single machine or piece of apparatus. The disconnecting means and the controllers shall be located in sight from the machine or apparatus.

(B) Motor. A separate disconnecting means shall be located in sight from the motor location and the driven machinery location.

Exception: A disconnecting means, in addition to the controller disconnecting means as required in accordance with Section 430.102(A), shall not be required for the motor where the disconnecting means for the controller is individually capable of being locked in the open position

I have had many calls commenting that we have so many rules, but as you can see there are very few revisions to the code. So in a nut shell the Nebraska State Electrical Division enforces the minimum standards of the 2005 National Electrical Code.

Randy Anderson
Chief State Electrical Inspector

Weatherproof EMT Connectors

Article 358.6, Listing Requirements, states, “EMT, factory elbows, and associated fittings shall be listed.” Article 358.42, Couplings and Connectors says, “Couplings and connectors used with EMT shall be made up tight. Where buried in masonry or concrete, they shall be concrete-tight type. Where installed in wet locations, they shall comply with 314.15(A).” That article says, in part, “In damp or wet locations, fittings shall be placed or equipped to prevent moisture from entering Boxes, conduit bodies, **and fittings** installed in wet locations shall be listed for use in wet locations.”

NEC Article 100, Definitions, defines damp and wet locations as follows:

Location, Damp. Locations protected from weather and not subject to saturation with water or other liquids but subject to moderate degrees of moisture. Examples of such locations include partially protected locations under canopies, marquees, roofed open porches, and like locations, and interior locations subject to moderate degrees of moisture, such as some basements, some barns, and some cold-storage warehouses.

Location, Wet. Installations under ground or in concrete slabs or masonry in direct contact with the earth; in locations subject to saturation with water or other liquids, such as vehicle washing areas; and in unprotected locations exposed to weather.

The State Electrical Division will begin issuing correction orders for violations of this provision January 1, 2006.



INSPECTOR'S COLUMN

by Roger Downs, District 4 Inspector

As I write this I am hoping the temperature stops below 100 degrees today. Yesterday, it hit the century mark, having a profound psychological effect on me; I stopped working. I don't mean I resigned from the State or my legs would no longer function. I mean that mentally I went into survival mode; anything else would have to share second place.

Unfortunately, a similar psychological “boiling point” sometimes occurs on electrical construction sites. Several different events can contribute to this phenomenon; a partial list might include:

1. The customer appears to be satisfied and pays the bill.
2. The project engineer appears to be satisfied and signs off on the job.
3. Everything that was supposed to work actually does.
4. Another big job is just getting started and workers are needed at once.

But what are the signs that this mysterious phenomenon will occur? How do those events lead to a “boiling point?” Again, a partial list might include:

1. The panelboard directory is not completely filled out or not even begun.
2. The grounding electrode system has not been bonded to the service equipment.
3. The Arc Flash warning labels have not been installed.
4. The emergency lighting has not been checked against the requirements of 700.12 (F) (2005 NEC)
5. The heat pump and air conditioner branch circuit over-current devices have not been coordinated with the nameplate requirements.

As I said, this is a partial list. The point is, the inspector might not consider the job to be “ready for Final” even if the contractor does, because the contractor has suffered from this strange phenomenon. Unfortunately, it is not an uncommon event.

As an inspector, when I am called for a Final Inspection, nothing makes me happier than being able to log it as a FINAL in the computer and know that tomorrow that permit will be gone. I get no pleasure in finding things incomplete or in error. Inspectors don't get a “bonus” for writing up contractors and going back for a re-inspection. Most of us have hundreds of permits in the computer and we dearly love seeing them go away.

So please take a minute in the office (or lots of minutes if it is still as hot as today) and see if there are any old jobs that are ready for inspection and call the inspector to let him know. If there are jobs that you know are “close” to being ready, take time to do the little things necessary to get it ready for that Final Inspection. Cooperation has to work both ways. You expect the inspector to do rough-ins as soon as possible to keep the job moving along, and the inspector has the right to expect you to finish jobs up in such a way that they are Finaled in a timely manner. That way nobody has to suffer the “heat” more than necessary.

(Continued from page 1)

Concrete Encased . . . (Cont'd)

- Where I work, water pipes coming into the house are copper. Can I rely on just the “water pipe ground” like I always did? No. The NEC has required a supplemental grounding electrode since 1978 because corrosion of copper water pipes, and their replacement with plastic could cause a complete loss of the electrical system’s connection to earth. In 1975 and earlier editions of the code, if the water pipe was likely to initially be, or become less than 10’ long or isolated, a supplementary electrode was required then, too. A supplementary electrode has been required for almost thirty years, based on the fact that as copper pipes corrode, they’re likely to be replaced with non-conductive materials. This is simply another type of supplemental electrode. Further, since 1978, all electrodes available at a property have been required to be bonded together. This particular type of electrode, known as a Ufer ground, is a much better electrode than a ground rod, and if available must be used according to national code.
- Dissipation of a lightning strike at the bottom of a footing could cause the footing to “explode”, and cause structural damage. Information regarding such damage was solicited prior to acceptance of the rule. People familiar with the use of Ufer grounding electrodes for installations such as cellular towers across the nation indicate there’ve been no such problems observed. Others believe footing failure due to a lightning strike possible. The code making panel, act-

ing on the best information available to it, believed the benefits of a Ufer grounding electrode outweighed non-documented (but possible) damage to footings, and incorporated the proposal into the code, in the interest of safety.

- Is it OK for a piece of re-bar to be stubbed out so I can connect to it later? Yes. In some localities in the Southwest and California, a stub-out of re-bar has been a requirement since 1981, as those localities have required a Ufer ground since then. Stub outs must be inside the basement, so that re-bar is not subject to corrosion, and there’s no path for moisture intrusion through rust particles along the re-bar.

As with any change in a code requirement, a learning curve is to be expected. **The 2005 NEC became state law April 25th. We would like to have this learning curve completed by January 1st, 2006, at which time the state will begin to write correction orders for violations of this requirement. In the interim, please make every effort to comply, not just because of potential liability, but because this electrode will provide improved electrical safety.** Visit with your project’s authority having jurisdiction, and work together for electrical safety. Everyone hates change, but a history of successful Ufer grounding for the last sixty years indicates the method’s worth.

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